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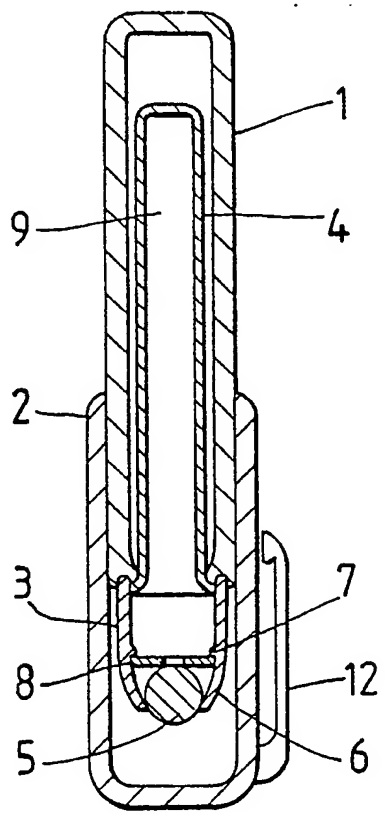
(54) Adhesive dispensers.

(57) Known adhesive dispensers comprise a reservoir for the adhesive and an applicator for applying the adhesive. However, these devices have the disadvantage that the layer or film of the adhesive applied is non-uniform varying in both thickness and width. Disclosed herein is an adhesive dispenser which overcomes this disadvantage by including a rotatable member (5) in the applicator (3) which both controls the flow of adhesive on to a surface to be glued and applies the adhesive to the surface in a uniform layer or film.

FIG.1.



EP 0 331 843 A1

ADHESIVE DISPENSERS

The present invention relates to adhesive dispensers for the application of a uniform adhesive film on to a surface. In particular, the present invention is directed to an adhesive dispenser for sticking together paper, cardboard or other similar materials.

It is well known that when glueing paper or cardboard parts together, the glue may be scattered or spilt thereby contaminating the hand of a user and/or the surface of the object being glued. In particular, these problems are specifically observed when glueing down envelope flaps, and applying stamps or labels to an envelope. In such cases, the application of the glue (usually a natural gum dispersed in water) is by means of a brush or an application rod. This however, presents many drawbacks, particularly as the glue may dry out through evaporation if the dispensing pot is left open. Further, there is no exact control of the width of the adhesive strip applied to the paper. In the case of a document enclosed in an envelope, the document may inadvertently become glued to the envelope itself. This may cause problems when the document is to be extracted from the envelope without damage.

Certain synthetic adhesives are stored and dispensed from adhesive flasks which are substantially elongate with a tapered upper part or dispensing nozzle. By pressing the flask which is normally formed of a flexible plastics material, the adhesive is forced out of the nozzle in the form of a filament. However, use of flasks of this type does not provide a fully satisfactory solution, since the adhesive is a viscous liquid and is dispensed as a filament having an irregular thickness. More adhesive than is normally required tends to be dispensed by pressing the flexible flask and when the two parts being glued are pressed together any excess adhesive may be expelled from between the two surfaces being glued, for example, on to a document inside the envelope as the flap of the same envelope is being glued. Moreover, the adhesive tends to dry out in the dispensing nozzle and therefore, the nozzle needs to be unclogged before each use, for example by using a piece of metal wire or a toothpick.

Another type of glue dispenser comprises a thin-necked bottle topped with a piece of gauze or fabric, or with a rubber cover provided with an opening for dispensing the glue. Again these devices suffer from the drying out of the glue in the neck of the bottle, and they do not provide means which effectively controls the width of the glue film being applied to a surface.

Solid stick adhesives, on the other hand, although overcoming the problem of irregular spreading of the adhesive on the surface, do not solve the problem of applying a uniform film of adhesive. In fact, the adhesive film is generally wider than necessary, e.g. that required for closing an envelope flap.

A commonly used device comprises a cylindrical body which is rotatable about its longitudinal axis and which is partially immersed in a glue reservoir so that only a part of its surface is wetted by the glue, and exposed for use. However, in use, the cylindrical body must be rotated in the glue reservoir to expose a new wet surface as the surface exposed to the air at any time is liable to dry out rapidly. For example, if glue is to be applied to a stamp, the user will, in all probability, wet his fingertips with the glue whilst applying it to the stamp. Furthermore, the application of glue using such a device to the flap of an envelope is not as effective and less controllable than if applied using a brush.

In accordance with the present invention, an adhesive dispenser is characterised in that the applicator includes a seating and a resilient component urging the rotatable member towards the seating to a position in which it protrudes from the seating, whereby if the dispenser is urged towards the surface with the rotatable member in contact with the surface, the contact pressure between the member and the surface moves the rotatable member translationally in the applicator against the action of the resilient component and away from the seating to provide a clearance between the seating and the member to apply adhesive to the surface as the applicator is moved across the surface with rotation of the rotatable member in contact therewith.

The resilient component advantageously provides a location for the member to retain it in the desired position urging it towards the seating and is flexible enough to allow some translational movement of the member in the applicator thereby providing the clearance to allow adhesive to be dispensed.

The resilient component has a plurality of cutouts formed around its periphery. This enables adhesive to flow from the reservoir to the applicator.

In one embodiment, the rotatable member is a sphere. In this case, the resilient component may comprise a disc with a central aperture which engages the surface of the sphere to retain it within the applicator. Advantageously, the dispenser of this embodiment can be made to be relatively small and portable.

In a further embodiment, the rotatable member may be a cylinder, the curved surface of which contacts the surface on to which adhesive is to be applied, the width of the adhesive film being related to the length of the cylinder. In this case, the resilient component may be rectangular and engage the cylinder by means of an elongate aperture formed in its centre. Alternatively, the resilient component may be a leaf spring of any convenient shape which has a rectangular aperture to engage the cylinder.

In a further embodiment, the resilient component may comprise a spirally wound spring to which is attached a cap portion, the cap portion providing a location for the rotatable member.

The dispensing of the adhesive from the reservoir takes place by a combination of phenomena relating to the adhesive and its flow. The adhesive should be sufficiently fluent to flow under gravity to the lowermost part of the reservoir where it is adjacent the rotatable member. The dimensioning of the member and its seating should be such that an adequate gap arises for the adhesive to penetrate and come into contact with the surface. Thereafter, as the dispenser is moved sideways, the rotatable member rotates and entrains the glue with it and deposits it on to the surface. The entrainment and rotation are assisted if the surface of the rotatable member is relieved or textured on a microscopic scale. This may be achieved e.g. by electroerosion treatment of the inner surfaces of the mould in which the rotatable member, e.g. of polytetrafluoroethylene, is moulded.

For a better understanding of the invention, reference will now be made by way of example only, to the accompanying drawings in which:-

Figure 1 is a cross-sectional view through a glue dispenser according to the invention;

Figure 2 is an enlarged detail of the glue dispensing end of the dispenser of Figure 1;

Figure 3 is a plan view of a resilient component forming part of the dispensing end shown in Figures 1 and 2;

Figure 4 is a perspective view of an alternative embodiment of a glue dispenser with a portion removed to show a cylindrical member and a resilient component;

Figure 5 is a cross-sectional side view taken along a longitudinal axis of the dispenser of Figure 4;

Figure 6 is a plan view of a resilient component utilised in the dispensing end of Figures 4 and 5;

Figure 7 shows a dispenser which is similar to that shown in Figure 1, but which incorporates a different type of resilient component;

Figure 8 shows a dispenser which is similar to that shown in Figure 4, but which incorporates a different type of resilient component;

Figure 9 illustrates the resilient component shown in the dispenser of Figure 7;

Figures 10 and 11 illustrate further embodiments of the resilient component which may be used in the dispenser shown in Figure 7;

Figure 12 illustrates the resilient component used in the dispenser of Figure 8; and

Figures 13 and 14 illustrate further embodiments of the resilient component which may be used in the dispenser shown in Figure 8.

Referring to Figure 1, a glue dispenser is shown which comprises a body 1 in which a cylinder 4 is mounted. The cylinder 4 is flexible and hollow and forms a reservoir for glue or adhesive 9. At a lower portion of the cylinder 4, a neck portion 3 is provided through which the glue or adhesive is dispensed. A cap 2 is provided to cover the neck portion 3 and engage the body 1 in order to protect the dispensing end of the dispenser from undesirable contact with any external object and to prevent evaporation of glue or adhesive when the dispenser is not being used. The cover 2 may be provided with a spring action clip 12 which permits the dispenser to be hooked inside a pocket. Naturally, this only applies to portable or pocket-sized dispensers.

The neck portion 3 is formed as a hollow cylinder having two openings, an upper opening (adjacent the body 1) and a lower opening. The upper opening may be provided with ribs, grooves, or any other type of fixing to permit its attachment to the cylinder 4 which is open only in its lower end adjacent the neck portion 3, and closed at the other end remote from the neck portion 3. Such a reservoir can be refilled or changed for another disposable cartridge full of adhesive if desired.

The neck portion 3 is dome-shaped at its lower end to form a seating 6, that is, at the dispensing end. The seating 6 has a diameter $\underline{d}$ less than the average inner diameter of the neck portion 3, and this smaller diameter $\underline{d}$ retains a sphere 5 in place within the lower end of the neck portion 3. The sphere 5 is an important element for applying the glue or adhesive to a surface which is to be bonded. The internal surface of neck portion 3 is provided with a detent 7 which may be in the form of a ring or comprise a plurality of small circularly aligned spaced protuberances. A resilient component 8 is interposed between the detent 7 and the top of the sphere 5, and retains the sphere 5 in the lower end of the neck portion 3 against the seating 6.

Figure 2 shows the lower end of neck portion 3 in more detail. As shown the diameter $\underline{d}$ of the

lower opening of the neck portion 3 is less than the diameter D of the sphere 5 so that the sphere tempcrarily blocks the lower opening by engaging the seating 6.

The resilient component 8 is shown in plan view in Figure 3. It is disc shaped and has a central aperture 11 which engages a portion of the surface of the sphere 5 (Figure 2). Around the periphery of the disc, a plurality of identical, equally spaced semi-circular cut-outs 10 is provided. Besides retaining the sphere 5 in its place, the component 8 acts like a spring to allow the sphere 5 to move away from the seating 6 in the lower opening into the neck portion 3 against the resilience of the component 8 during use of the dispenser.

The adhesive 9 contained in cylinder 4 is a relatively viscous but flowable liquid. As mentioned previously, the cylinder 4 is fixed by pressure or any suitable means to the upper open end of the neck portion 3 in such a way that the liquid adhesive 9 flows into the neck portion 3 to make contact with the sphere 5. The sphere 5 is limited in its translational motion by the diameter d of the neck portion 3, and the resilient component 8. The material from which the component 8 is made is flexible and may be any suitable elastomeric or plastics material or even a metallic alloy provided with a certain elasticity. The elastic property of the component 8 is essential, as it serves two functions:-

(a) forming an upper stop for the sphere 5; and

(b) allowing translational movement of the sphere 5 by deflecting a given amount dependent on the elasticity of the material used to permit a contact pressure to be maintained on the sphere 5 when the glue dispenser is being used.

The central aperture 11 of the component 8, apart from acting as an upper limit stop for the sphere 5, provides a path for allowing the flow of liquid adhesive through it when the sphere 5 is not pressed upward against the action of the resilient component 8. The cut-outs 10, as shown in Figure 3. always provide a free pathway for the viscous liquid adhesive allowing it to keep in contact with the sphere 5. As mentioned before the detent 7 can be a continuous ring formed on the inner wall of the neck portion 3 or a plurality of protuberances. The cut-outs 10 are dimensioned to allow the flow of adhesive 9 from above the component 8 to the space in which the sphere 5 is positioned. However care needs to be taken so that the cut-outs 10 are not too large so that there is a loss of elasticity or relative rigidity of the component 8. The size of the cut-outs 10, however, is related to the size of the dispenser and the relative rigidity or elasticity of the material used to form component 8.

The glue or adhesive 9 flows from the cylinder 4 into the neck portion 3 through the cut-outs 10 and aperture 11 formed in the resilient component 8. As the sphere is rotated during application of the adhesive, the rolling surface of the sphere picks up adhesive from within the neck portion 3 and carries it round to the lower opening for dispensing. This is only possible once the sphere 5 in the dispenser is depressed against the resilience of the resilient component 8 to produce a clearance between the seating 6 formed at the lower opening and the sphere itself to allow the adhesive to be applied.

Figures 4, 5 and 6 are related to a further embodiment of the glue dispenser (like items being numbered alike with a "′"). It is to be noted that the operation of this dispenser is the same as that previously described with reference to Figures 1, 2 and 3, and that variations are only related to the shape of the dispenser. In this case, the sphere 5 is replaced by a cylindrical member 5′, the cylindrical surface of which picks up and applies the adhesive to the surface as it is rolled over it.

Referring now to Figure 4, which is a perspective view of a further embodiment of a glue dispenser. The shape of the seating 6′ of the neck portion 3′ is now cylindrical instead of spherical. The body and the protective cap (not shown) of the dispenser may be prismatic instead of cylindrical to accommodate the change in shape. Furthermore, as the adhesive is dispensed using a cylindrical member instead of a sphere, wider strips of adhesive can be obtained than if a sphere is used.

As adhesive is applied using a cylindrical member 5′, the tapering of the lower part and hence the seating 6′ of the neck portion 3′ is made to follow the geometry of the cylindrical member 5′, thereby retaining the member and allowing a layer of adhesive to be dispensed. As the dispenser is of a different shape, that is prismatic instead of cylindrical, the resilient component 8′ has the approximate shape of a rectangle, which has an inner aperture 11′ in the form of an elongated slot as shown in Figure 6. The elongate slot is as long as the cylindrical member 5′. In a similar fashion to the previous embodiment, square cut-outs 10′ are disposed around the periphery of the component 8. However, because of the cylindrical shape of the member 5′, the cut-outs 10′ are not equispaced as before. The retaining function and the elastic properties of the component 8′ need to be similar to those shown for the component 8, shown in Figure 3, but allowing for the change in size and shape of the dispenser.

It should be noted that in the case of the embodiment shown in Figures 1, 2 and 3, the component 8 has a central aperture 11 which not only keeps the sphere 5 in its proper position but as it is circular in shape, it ensures that the sphere

5 will roll without being displaced out of its former position when subjected to an upward force when the dispenser is being used. In case the material used to make the component 8 is not sufficiently rigid to maintain good retention of the sphere 5 in its working position, the component can have a greater thickness and the aperture 11 can have its walls tapered to receive more suitably the surface of the sphere 5 which comes into contact with the component 8. This ensures that the sphere is maintained in its proper position.

Similarly, for the cylindrical member 5′ it may be necessary to employ a resilient component 8′ of greater thickness. In this case, the walls defining the aperture 11′ may be shaped to match the curvature of the cylindrical surface of the cylindrical member 5′.

In both embodiments, if the components 8 and 8′ have a greater thickness, proper dimensioning of the cut-outs 10 and 10′ will ensure that the required circulation of adhesive is achieved.

In operation, when the adhesive reservoir contains sufficient adhesive the sphere 5 or cylindrical member 5′ is pressed on to the surface to be glued. The dispenser is then moved over the surface following the direction of the line where the glue is to be applied. This ensures that an adhesive layer of uniform width and constant thickness is applied as desired to all the surface to be glued. As pressure is exerted on the sphere 5 or the cylindrical member 5′, the associated resilient component 8 or 8′ will maintain a certain return pressure on the sphere 5 or cylindrical member 5′, thereby ensuring that a constant clearance is maintained between the lower ends and their respective seatings 6 and 6′ of the neck portions 3 and 3′, and the sphere or member. This clearance depends on the elastic properties of the components 8 and 8′, on the viscosity of the adhesive employed, and also on the pressure applied.

The role of the sphere 5 or cylinder 5′ is not a flow controller for a gravity flow, as the liquid adhesive is not dispensed by capillary action. It has the function of obstructing the exit of a viscous or semi-paste adhesive from the dispenser, the mode of flow of the adhesive not being determined by capillary action. The sphere 5 or cylinder 5′ is not left free to vary its position according to the flow of the adhesive, since it is precisely located within a well defined limited range of positions that is, between the seating 6, 6′ and the resilient component 8, 8′.

Referring now to Figures 7 and 9, which illustrate another embodiment of a resilient component which may be used in a dispenser having a sphere as the rotatable member. The operation of the dispenser incorporating such a component is identical to that described previously.

The resilient component illustrated comprises a spirally wound spring 13 which is expanded into a frusto-conical shape and carries at one end a spherical concave cap 14 which engages the sphere 5. The end of the spring carrying the cap 14 is of smaller diameter than the other end of the spring which engages the detent 7 as previously described. During use of the dispenser, the sphere is pressed into the neck portion 3 against the action of the spring 13.

Figures 10 and 11 illustrate further embodiments of the spring-cap arrangement shown in Figures 7 and 9. In Figure 10, the spherical concave cap 14 is replaced by a ring 18 which is attached to the lower end of the spring 17, the spring 17 being similar to spring 13. The ring 18 is designed to be matched with the surface of the sphere 5. If the ring 18 is made of a wire which is too thick to provide adequate engagement between the ring 18 and the sphere 5, the inner surface of the ring can be shaped to produce the desired engagement with the sphere 5.

In Figure 11, a spring 15, similar to the spring 13 of Figures 7 and 9, carries at its lower end a claw 16. The claw 16 is shaped like a skeleton of the cap 14 and is made using segments of curved wire which form a structure to support the sphere 5.

It is desirable that both the cap 14 and the claw 16 each have a radius of curvature which is substantially the same as the radius of curvature of the sphere 5 which they support.

Figures 8 and 12 illustrate a resilient component for use in a dispenser having a cylinder as the rotatable member. As described with reference to Figures 7, 9, 10 and 11, a spirally wound spring 19 carries a cylindrical concave cap 20 at its lower end. Spring 19 is similar to spring 13 as described previously. The cylindrical cap 20 engages the cylindrical member 5′ and retains it within the lower end of the dispenser 4′ urging it against the seating 6′. As described before, the cylinder 5′ is pressed into the neck portion 3′ against the action of the spring 19.

Figures 13 and 14 illustrate further embodiments of the spring-cap arrangement which can be used as the resilient component in a dispenser as illustrated in Figure 8.

Figure 13 illustrates a support element 22 attached to the lower end of spring 21. The support element 22 is formed by a series of curved wire segments which are attached to a straight central wire.

Figure 14 shows an element 24 which is formed from wire and which is designed in the shape of a saddle to engage the surface of cylindrical element 5′. The element 24 is attached to a spring 23.

Springs 19, 21 and 23 are similar to spring 13, and naturally the radius of curvature of each of the parts designed to engage the cylindrical member 5′ is chosen to match that of the cylindrical member 5′ itself.

The springs 19, 21 and 23 may have a circular cross section or, in order to improve the fit within the inner part of the neck portion 3′, may be slightly elliptical.

The spring-cap arrangements as described with reference to Figures 7 to 14, may be inserted into their respective neck portions 3, 3′ of the dispensers as shown in Figures 7 and 8 from the open end as the top coil of each spring needs only to be distorted so that it passes beneath the detent 7, 7′ as described.

As will readily be understood by those skilled in the art the number of adhesives and substrates may vary greatly, and the scope of the present invention can be extended to include such variations. This is because these variations do not substantially alter in the general principle of operation of the glue dispenser according to the present invention.

While it is foreseen that a small dimensioned device can be used in offices or in schoolrooms or even carried around inside a pocket (in which case the model provided with a spherical application element is preferred), the scope of the present invention includes the construction of larger size glue dispensers, preferably having a cylindrical member in the neck portion. In the larger dispensers, a large adhesive reservoir is required instead of the small adhesive cylinder. In such an arrangement the large reservoir can be connected by a duct to the dispenser, the dispenser being secured to a mechanical arm in an assembly line (e.g. an automatic cardboard containers assembly line). Thus, in an embodiment in which large-sized dispensers are intended, the adhesive may be kept in a large tank which has means for homogenizing and constant refilling are provided.

Naturally, the elastic characteristics of the resilient component 8′ will be chosen to allow continuous operation of the dispenser.

Furthermore, the composition of the resilient components must be chosen to be compatible with the adhesive to be dispensed. However, if the adhesive is not likely to attack the elastomeric material used, commonly known resilient rubbers may be used to form the resilient component 8, 8′.

As an alternative to elastomeric materials, the resilient member 8, 8′ may be in the form of a highly elastic thin metal plate. This has the advantage of being resistant to chemical attack by most adhesive materials.

In order to improve the dispensing of adhesive from the applicator 3, 3′, the surface of the rotatable member 5, 5′ may have a surface texture which assists in the transfer of adhesive from the applicator 3, 3′ on to a surface on to which the adhesive is to be deposited.

As the adhesive industry is quite diversified and is in constant evolution, it is not possible to define a single type of adhesive which would be preferred for use with the present invention. However, it must be understood that only one part adhesives are intended for use with the dispenser of the present invention, as the dispenser does not provide means for mixing and immediately dispensing two part or two component adhesives such as epoxy resin systems.

Claims

1. An adhesive dispenser comprising a reservoir (4; 4′) for storing an adhesive and an applicator (3; 3′) connected thereto for applying the adhesive to a surface, the applicator (3; 3′) including a rotatable member (5; 5′) which controls the flow of adhesive and applies it to the surface, characterised in that the applicator includes a seating (6) and a resilient component (8; 8′) urging the rotatable member (5; 5′) towards the seating (6), to a position in which it protrudes from the seating, whereby if the dispenser is urged towards the surface with the contact pressure between the member (5; 5′) and the surface moves the rotatable member (5; 5′) translationally in the applicator (3; 3′) against the action of the resilient component (8; 8′) and away from the seating (6) to provide a clearance between the seating (6) and the member (5; 5′) to apply adhesive to the surface as the applicator is moved across the surface with rotation of the rotatable member (5; 5′) in contact therewith.

2. A dispenser according to Claim 1, characterised in that the resilient component (8; 8′) is a plate having an aperture (11; 11′) for engaging the rotatable member (5; 5′).

3. A dispenser according to Claim 2, characterised in that the resilient component (8; 8′) has a plurality of cut-outs (10; 10′) arranged around its periphery to allow free flow of adhesive from the reservoir (4; 4′) to the applicator (3; 3′).

4. A dispenser according to any one of Claims 1 to 3, characterised in that the resilient component (8; 8′) engages a portion (7; 7′) of the applicator (3; 3′).

5. A dispenser according to Claim 4, characterised in that the portion (7; 7′) comprises a continuous ring formed on the internal surface of the applicator (3; 3′).

6. A dispenser according to Claim 4, characterised in that the portion (7; 7′) comprises a plurality of protuberances formed on the internal surface of the applicator (3; 3′).

7. A dispenser according to any one of Claims 1 to 6, characterised in that the rotatable member is a sphere (5).

8. A dispenser according to Claim 7, characterised in that the resilient component is a circular disc (8) and has a central circular aperture (11) for engaging a portion of the sphere (5).

9. A dispenser according to any one of Claims 1 to 6, characterised in that the rotatable member is a cylinder (5′).

10. A dispenser according to Claim 9, characterised in that the resilient component is a rectangular plate (8′) and has a central elongate aperture (11′) for engaging a portion of the cylinder (5′).

11. A dispenser according to Claim 1, characterised in that the resilient component (8; 8′) comprises a spirally wound spring (13; 15; 17; 19; 21; 23) to which is attached a cap portion (14; 16; 18; 20; 22; 24) which engages the rotatable member (5; 5′).

12. A dispenser according to Claim 11, characterised in that the cap portion (14; 16; 18; 20; 22; 24) has a radius of curvature matched to that of the rotatable member (5; 5′).

13. A dispenser according to Claim 11 or 12, characterised in that the spring (13; 15; 17; 19; 21; 23) is in an expanded frusto-conical shape.

14. A dispenser according to any one of the preceding claims, characterised in that the rotatable member (5; 5′) has a textured surface which assists in the transfer of adhesive from the applicator (3; 3′) to the surface.

FIG.1.

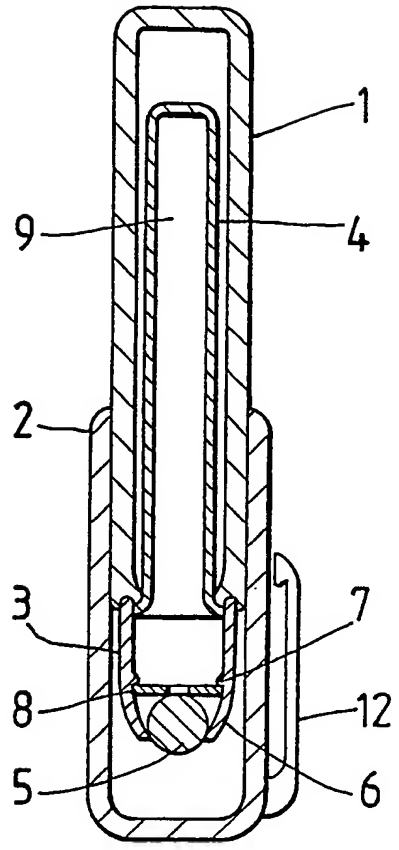


FIG.2.

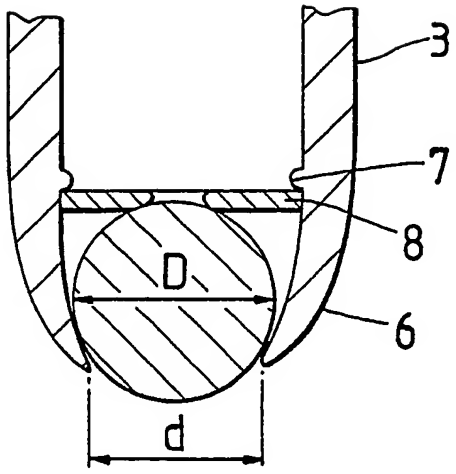


FIG.3.

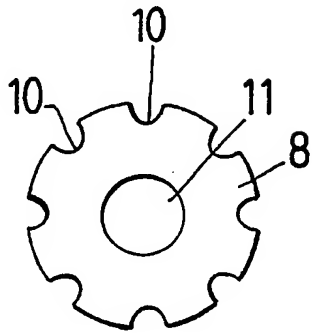


FIG.4.

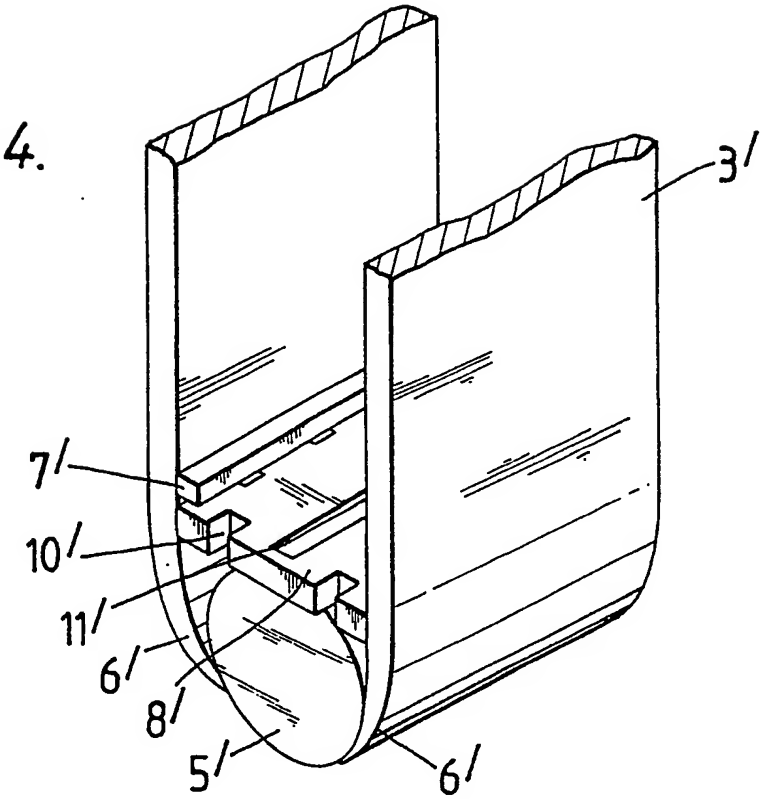


FIG.5.

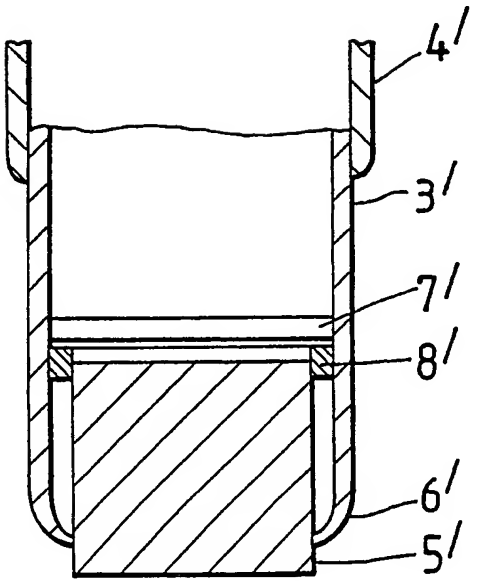


FIG.6.

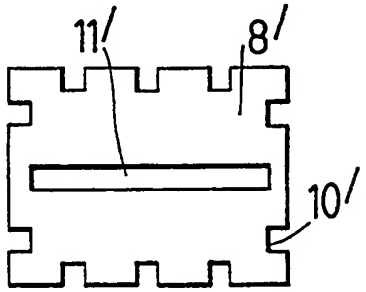


FIG.7.

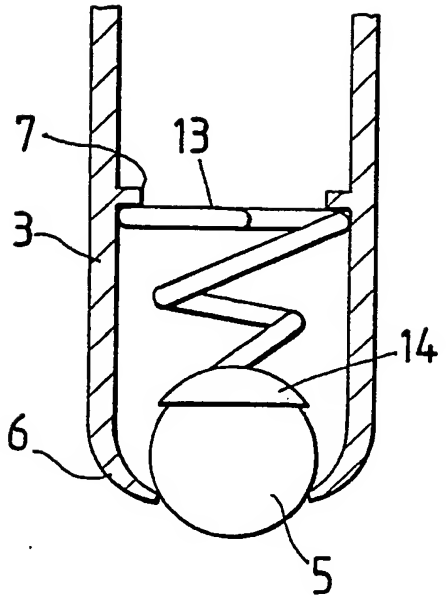


FIG.8.

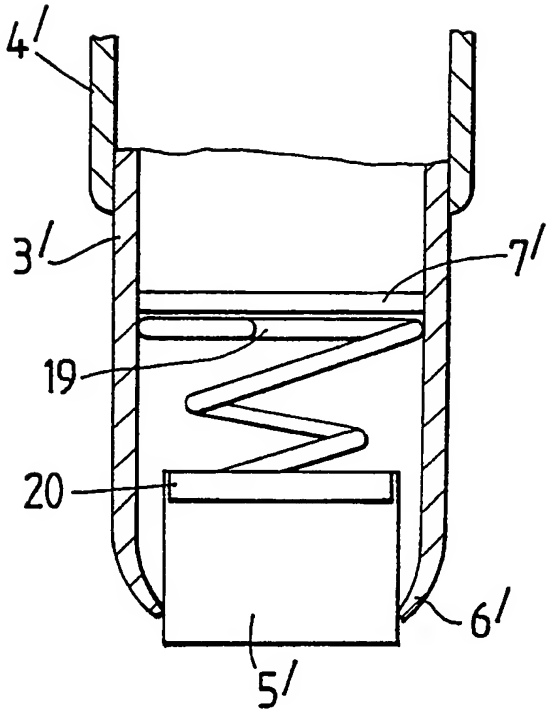


FIG. 9.

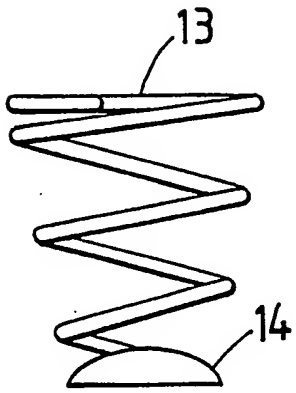


FIG. 12.

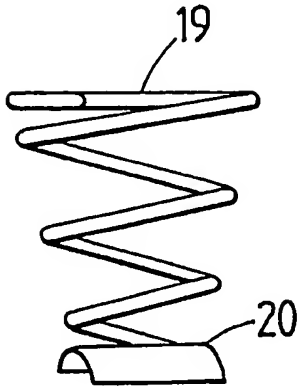


FIG. 11.

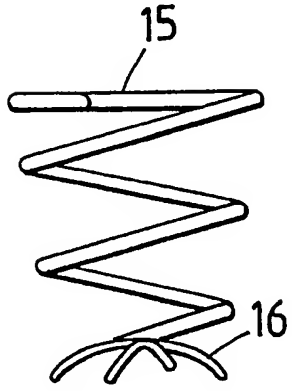


FIG. 10.

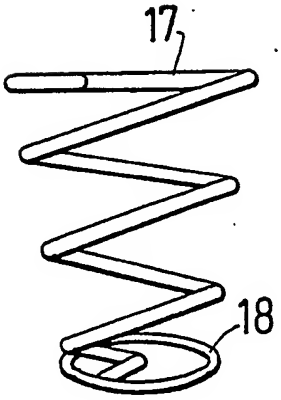


FIG. 13.

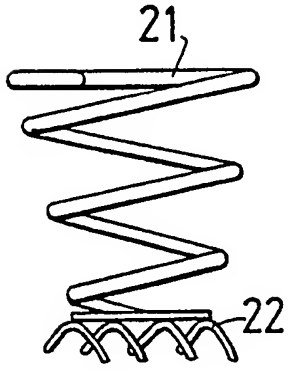
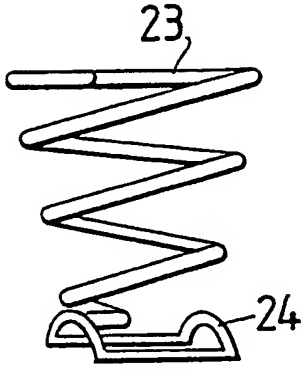


FIG. 14.



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EUROPEAN SEARCH REPORT

Application Number

EP 88 31 1134

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-C-3044223 (SLABY) * column 4, line 17 - line 28 *	1, 7, 11	B43M11/08 B43K7/00 B43K5/18
X	FR-A-1137013 (CHERRIER) * the whole document *	1, 4, 5, 7, 11, 13	A45D34/04
X	US-A-2975466 (FILLMORE) * column 2, line 10 - line 31 *	1-3, 8	
X	DE-C-389452 (VOSTER & MULLER) * the whole document *	1, 7, 11	
X	FR-A-1071169 (DACHINGER) * page 2, column 2, line 6 - line 30 *	1, 7, 11, 12	
A		4, 5	
X	DE-C-812049 (PICKHARDT) * the whole document *	1, 7, 11, 13	
A	US-A-2444003 (CHESLER) * column 2, line 40 - line 54 *	3	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	EP-A-210312 (PILOT MAN NEN HITSU K.K.) * page 5, line 34 - page 6, line 3 *	6	B43M A45B B65D
A	DE-C-958995 (HALFMANN) * claim 1 *	1, 9	B05C
A	US-A-3100908 (ENGLE) * column 2, line 34 - line 39 *	10	
A	FR-A-612288 (KENNEDY) * page 4, line 75 - line 83 *	12	
A	US-A-4342522 (MACKLES) * the whole document *	1, 7, 14	
A	US-A-3048881 (ACKERMAN) * the whole document *	1, 7, 8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 JUNE 1989	LAMMINEUR P.C.G.

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